Claims

What is claimed is:

1. An optical identification element attached to a chemical, comprising:

an optical substrate;

at least a portion of said substrate having at least one diffraction grating disposed therein, said grating having at least one refractive index pitch superimposed at a common location;

the grating providing an output optical signal when illuminated by an incident light signal;

said optical output signal being indicative of a code in said substrate; and

the chemical being attached to said substrate.

2. The apparatus of claim 1 wherein said substrate is made of a glass material.

3. The apparatus of claim 1 wherein said code comprises a plurality of bits.

4. The apparatus of claim 1 wherein the number of pitches is indicative of the number of said bits in said code.

5. The apparatus of claim 1 wherein said substrate has a length that is less than about 500 microns.

6. The apparatus of claim 1 wherein said substrate has a cylindrical shape.

7. The apparatus of claim 1 wherein said grating is a blazed grating.

8. The apparatus of claim 1 wherein said code comprises a plurality of bits, each bit having a plurality of states.

9. The apparatus of claim 1 wherein said substrate has a reflective coating disposed thereon.

10. The apparatus of claim 1 wherein said substrate is has a magnetic or electric charge polarization.

11. The apparatus of claim 1 wherein said substrate has a grating region where said grating and a non-grating region where said grating is not located; and wherein said substrate has a plurality of grating regions.

12. The apparatus of claim 1 wherein said substrate has geometry having holes therein.

13. The apparatus of claim 1 wherein said substrate is has a geometry having protruding sections.

14. The apparatus of claim 1 wherein at least a portion of said substrate is has an end cross sectional geometry selected from the group: circular, square, rectangular, elliptical, clam-shell, D-shaped, and polygon

15. The apparatus of claim 1 wherein at least a portion of said substrate is has a side view geometry selected from the group: circular, square, rectangular, elliptical, clam-shell, D-shaped, and polygon.

16. The apparatus of claim 1 wherein at least a portion of said substrate is has a 3-D shape selected from the group: sphere, a cube, a pyramid.

17. The apparatus of claim 1 wherein said code comprises at least a predetermined number of bits, said number being: 3, 5, 7, 9, 10, 12, 14, 16, 18, 20, 24, 28, 30, 40, 50, or 100.

18. A microparticle attached to a chemical comprising:

an optical substrate;

at least a portion of said substrate having at least one diffraction grating disposed therein, said grating having at least one refractive index pitch superimposed at a common location;

the grating providing an output optical signal when illuminated by an incident light signal;

said optical output signal being indicative of a code in said substrate; and

the chemical being attached to said substrate.

19. A method of performing a multiplexed experiment, comprising:

obtaining an optical substrate at least a portion of which having a diffraction grating with one or more refractive index pitches superimposed at a common location;

attaching a chemical to said substrate;

illuminating said substrate with incident light, said substrate providing an output light signal; and

reading said output light signal and detecting a code therefrom.